CLAIMS

What is claimed is:

1. A method of generating a distance map comprising the steps of:

a) identifying a boundary curve of a source image; and

b) assigning a distance value to each pixel of the distance map associated with a corresponding region of the source image, wherein for each pixel, the distance value represents a distance between a center of that pixel and a nearest point of the boundary curve, wherein the nearest point is located to sub-pixel accuracy.

2. The method of claim 1 wherein step a) further comprises the steps of:

i) generating an unsigned graylevel image corresponding to the source image; and

ii) applying a threshold value to the unsigned graylevel image to form a signed graylevel image, wherein a sign change between graylevel values of adjacent pixels indicates a boundary curve intersection, wherein the sign change identifies the adjacent pixels as boundary pixels.

3. The method of claim 2 wherein step b) further comprises the step of:

i) calculating a distance from a center of each boundary pixel to a nearest interpolated boundary curve intersection as the distance value for boundary pixels; and

ii) propagating distance values from each pixel to adjacent pixels to generate an unsigned interim distance map.

4. The method of claim 3 wherein for each selected pixel, m_i = the minimum of the distance values of the neighboring pixels above and below the selected pixel, wherein m_j = the minimum of the distance values of the neighboring pixels to the left and right of the selected pixel, wherein h corresponds to a pixel size, wherein Tij = a current distance value for the selected pixel, wherein a proposed update value, u, is assigned a value as follows:

$$u = \frac{m_i + m_j + \sqrt{2h^2 - (m_i - m_j)^2}}{2}, \text{ if } |m_i - m_j| < h \text{ otherwise } u = \min(m_i, m_j) + h,$$

wherein Tij is updated to $\min(Tij, u)$.

5. The method of claim 3 wherein step b) includes the step of performing each of the following passes to propagate the distance information throughout the image: top-to-bottom and left-to-right, top-to-bottom and right-to-left, bottom-to-top and left-to-right, bottom-to-top and right-to-left.

6. The method of claim 3 wherein step b)(ii) further comprises the step of assigning a sign of each pixel of the signed graylevel image to the distance value in the corresponding location of the unsigned interim distance map to generate a signed first distance map.

7. The method of claim 6 further comprising the step of:

c) downsampling the first distance map to generate a second distance map having a second resolution.

8. The method of claim 7 further comprising the step of:

d) applying a soft threshold filter to the second distance map to reconstruct the source image, wherein the reconstructed source image has the second resolution.

9. The method of claim 7 further comprising the step of:

d) applying an interpolation filter to the second distance map to generate an interpolated distance map having the first resolution.

10. The method of claim 9 further comprising the step of:

e) applying a soft threshold filter to the interpolated distance map to generate a reconstructed source image having the first resolution.

11. The method of claim 1 wherein the source image comprises boundary curves defined by continuous parametric functions.

12. A method comprising the steps of:

a) computing a first distance map of a source image; and

b) downsampling the first distance map having a first resolution to form a second distance map having a second resolution.

13. The method of claim 12 further comprising the step of:

c) applying a soft threshold filter to the second distance map to form a reconstructed source image having the second resolution.

14. The method of claim 12 further comprising the steps of:

c) interpolating the second distance map to generate an interpolated distance map having the first resolution; and

d) applying a soft threshold filter to the interpolated distance map to generate a reconstructed source image having the first resolution.

15. The method of claim 12 wherein the first resolution is greater than the second resolution.

16. The method of claim 12 wherein step a) further comprises the steps of:

i) identifying at least one boundary curve of the source image; and

ii) assigning a distance value to each pixel of the first distance map, wherein each pixel is associated with a region of the source image, wherein for each pixel, the distance value represents a distance between a center of that pixel and a nearest point of a nearest boundary curve, wherein the nearest point is located to sub-pixel accuracy.

17. The method of claim 16 wherein step (a)(i) further comprises the step of applying a threshold value to a graylevel rendering of the source image to form a signed graylevel image, wherein a sign change between graylevel values of adjacent pixels indicates a boundary curve lies between centers of the adjacent pixels, wherein the sign change identifies the adjacent pixels as boundary pixels.

18. The method of claim 16 wherein step (b)(ii) further comprises the steps of:

1) calculating a distance from a center of each boundary pixel to a nearest interpolated boundary curve intersection as the distance value for boundary pixels; and

2) propagating distance values from each pixel to adjacent pixels to generate an unsigned distance map.

19. The method of claim 18 wherein step b)(ii) further comprises the step of assigning a sign of each pixel of the signed graylevel image to the distance value in the corresponding location of the unsigned distance map to form the first distance map.

20. The method of claim 14 wherein the threshold filter is a soft threshold filter such that distance values less than a first pre-determined threshold (*z1*) are mapped to a first value, wherein distance values greater than a second pre-determined threshold (z2) are mapped to a second value, wherein z1<z2, wherein distance values between *z1* and *z2* are mapped to unsigned graylevel values [0,N].